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| 10/552,507 | 12/19/2006 | Akihisa Inoue | 053128 | 4427 |

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| EXAMINER |
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ZHENG, LOIS L

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| ART UNIT | PAPER NUMBER |
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1733

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07/05/2011

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentmail@whda.com

| | | | |
|------------------------------|--------------------------------------|-------------------------------------|--|
| Office Action Summary | Application No. 10/552,507 | Applicant(s) INOUE ET AL. | |
| | Examiner LOIS ZHENG | Art Unit 1733 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 April 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/20/11</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of Claims

1. Claims 1-2 and 4 are amended in view of applicant's claim amendments filed 20 April 2011. Therefore, claims 1-2 and 4 are currently under examination.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baiker et al. US 4,916,109(Baiker), further in view of "Crystallization of amorphous Zr-Ni alloys in the presence of H₂, CO, O₂, N₂ and argon gases", Aoki et al., Journal of Materials Science, Vol. 21 pages 793-798, 1986(Aoki).

Baiker teaches a process to form an amorphous palladium zirconium oxide material, such as Pd₃₃(ZrO₂)₆₇, used as a catalyst for oxidation of CO (abstract, col. 1 lines 55-57), comprising forming an amorphous PdZr alloy by melting and rapid cooling at a cooling rate of 10⁶-10⁹°C/s(col. 1 lines 58-64), followed by heating the PdZr alloy in an oxygen-containing gas stream at a temperature between 150-350°C to activate the PdZr alloy, which results in palladium particles in ZrO₂ matrix(col. 2 lines 14-33). Example 2 of Baiker further teaches that a Pd₃₃Zr₆₇ alloy is activated in an air stream at a temperature of 280°C (col. 5 lines 16-19, 53, Tables 1-2, col. 3).

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Regarding claims 1 and 4, Baiker does not explicitly teach the claimed third metal M in the alloy composition.

Aoki teaches that zinc based alloy such as ZnNi and ZnPd amorphous alloys absorbs considerably quantity of hydrogen and also acts as catalyst for hydrogenation of carbon monoxide(introduction). Since ZnNi and ZnPd are functionally equivalent hydrogen absorbing material and catalyst material, one of ordinary skill in the art would have found it obvious to have partially substituted Pd with Ni(i.e. use a combination of Pd and NI) in the ZnPd metal alloy of Baiker and achieve the same expected success of obtaining a hydrogen absorbing material and/or a catalyst material. In addition, such a substitution would have produced a ZrPdNi alloy with a composition that at least overlaps the claimed ZrPdNi composition. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05. The selection of claimed ZrPdNi composition range from the disclosed range of Baiker in view of Aoki would have been obvious to one skilled in the art since Baiker in view of Aoki teach the same utilities in their disclosed ZrPdNi composition range.

In addition, since Baiker in view of Aoki teach a ZrPdNi alloy forming process that is the same as claimed and uses a ZrPdNi alloy material that is substantially the same as claimed, one of ordinary skill in the art would have expected the ZrO₂ matrix formed by the process of Baiker in view of Aoki to be ultrafine particles as claimed. Since Aoki teaches ZnNi and ZnPd are good hydrogen storage materials, one of ordinary skill in the art would have found that the ZrPdNi alloy derived from the teachings of Baiker in view of Aoki is capable of functioning as a hydrogen storage alloy, and storing such a

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material in a storage container would have been well within the skills of one of ordinary skill in the art since the hydrogen storage alloy of Baiker in view of Aoki is in powder form.

Regarding claim 2, since Baiker in view of Aoki teaches a substantially the same alloy composition and is produced by the same heat treatment step and forms the same amorphous alloy with dispersed ultrafine metal and ZrO_2 particles as claimed, one of ordinary skill in the art would have expected the amorphous hydrogen storage alloy material of Baiker in view of Aoki to have substantially the same hydrogen storage amount of 2.5 wt% or more in a weight ratio relative to Pd contained in the hydrogen storage alloy material as claimed.

Response to Arguments

4. Applicant's arguments filed 20 April 2011 have been fully considered but they are not persuasive.

In the remarks, applicant argues that Baiker's invention is not directed to a hydrogen storage and/or transportation container.

The examiner does not find applicant's argument convincing, because the scope of Baiker includes a powder formed product(col. 2 lines 9-11). Therefore, it would have been well within the skills of one of ordinary skill in the art would have found it obvious to store such a powder form product in a container.

Applicant further argues that Baiker teaches a catalyst not a hydrogen storage alloy material.

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The examiner does not find applicant's argument convincing because Aoki teaches that zinc based alloy such as ZnPd amorphous alloys, same as the material in Baiker, absorbs considerably quantity of hydrogen and also acts as catalyst for hydrogenation of carbon monoxide(introduction), which shows that the material of Baiker is a hydrogen storage alloy material in addition to its function as a catalyst.

Applicant further argues that Inventive Example 1 and Comparative Example 1 in the specification show that the hydrogen storage alloy material as claimed is remarkably superior to the $Zr_{65}Pd_{35}$ disclosed in Baiker.

The examiner does not find applicant's argument convincing because Inventive Example 1 is not commensurate with the scope of the instant invention. Instant claim 1 recites a group of Zr alloys that can be described by the formula $Zr_{100-a-b}Pd_aNi_b$, wherein $15 \leq a \leq 40$, and $2 < b \leq 10$. However, Inventive Example 1 only represents one of the many Zr alloys that satisfy this formula. Therefore, Inventive Example 1 is not sufficient to show superior results over Baiker for the entire group of claimed Zr alloys.

Applicant further argues that Ni and Pd are elements of different groups and one of ordinary skill in the art would not have found it obvious to replace Ni in ZrNi with Pd based on Aoki.

The examiner does not find applicant's argument convincing because Aoki's teaching shows that ZrNi and ZrPd alloys are both highly hydrogen absorbing materials and are both catalysts for CO hydrogenation, one of ordinary skill in the art would have realized that ZrNi and ZrPd alloys are functionally equivalent materials since they both performs the same functions such as absorbing/storing hydrogen and accelerating CO

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hydrogenation. As set forth in MEPEP 2144.06, combining or substituting equivalents known for the same purpose is prima facie obvious. Therefore, one of ordinary skill in the art would have found it obvious to have partially substituted Pd in the ZrPd metal alloy of Baiker with Ni, or combine ZrNi of Aoki and ZrPd of Baiker and achieve the same expected success of obtaining a hydrogen absorbing material and/or a catalyst material. Additionally, Aoki's discussion of ZrNi alloy as a catalyst for hydrogenation of Co is not a negative teaching against Aoki's teaching of ZrNi and ZrPd as materials known for the same purpose.

In addition, the examiner has discovered following supporting documents demonstrating using metals such as Zr with Pd and Ni together are known in the hydrogen storage alloy art:

Grasselli et al. US 4,728,580(Grasselli) teach an amorphous hydrogen storage alloy of formula $A_aM_bM'_c$, wherein A can be Pd, M can be Ni, and M' can be Zr(abstract). Example 14 of Grasselli further teaches a $Pd_aNi_bZr_c$ alloy wherein Zr, Pd and Ni are used together in a hydrogen storage alloy.

Gamo et al. US 5,490,970(Gamo) teach a hydrogen storage alloy having a formula $Zr_\alpha Ni_\beta M_\gamma$, wherein M can be Pd(col. 5 lines 51-62).

Applicant further argues that even within the ZrNi alloys, different alloy compositions produce different hydrogen absorption characteristics as evidenced by several supporting references as cited on the IDS filed 20 April 2011.

Although applicant's supporting references show different hydrogen absorption properties for ZrNi alloys of different composition, they also convey the same

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information that various ZrNi alloys are all considered hydrogen storage alloy material.

Therefore, the examiner does not find applicant's argument convincing.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LOIS ZHENG whose telephone number is (571)272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Roy King/
Supervisory Patent Examiner, Art
Unit 1733

LLZ